

CLAIMS

What is Claimed is:

1. A switched mode power supply comprising:
5 a first switch coupled to an input power source;
a second switch coupled to ground;
an output filter coupled to a phase node defined between said first and second switches, the first and second switches being responsive to a pulse width modulated signal to thereby regulate power provided to the output filter; and
10 a feedback loop adapted to adjust operation of said first and second switches in response to changed operating conditions, said controller comprising at least one delay control circuit adapted to delay delivery of said pulse width modulated signal to at least one of said first and second switches to preclude simultaneous conduction of said first and second switches and minimize dead
15 time between state transitions of said first and second switches, said delay control circuit detecting a phase difference between state transitions of said first and second switches and providing a delay in accordance with a magnitude of said phase difference.
2. The switched mode power supply of Claim 1, wherein said delay control
20 circuit further comprises a phase detector providing an up or down signal proportional to said phase difference.
3. The switched mode power supply of Claim 2, wherein said delay control circuit further comprises a charge pump coupled to said phase detector and converting said up or down signal to a control voltage.
- 25 4. The switched mode power supply of Claim 3, wherein said delay control circuit further comprises an analog delay device providing a time delay corresponding to said control voltage.

5. The switched mode power supply of Claim 3, wherein said delay control circuit further comprises a capacitor coupled to said charge pump, said capacitor integrating said control voltage.

6. The switched mode power supply of Claim 1, wherein said at least one
5 delay control circuit further comprises a first delay control circuit associated with said first switch and a second delay control circuit associated with said second switch.

7. The switched mode power supply of Claim 1, wherein said input power source comprises an output of a galvanic isolation transformer of a DC-to-DC converter.

8. In a switched mode power supply comprising a first switch coupled to an
10 input power source, a second switch coupled to ground, and an output filter coupled to a phase node defined between said first and second switches, said first and second switches being responsive to a pulse width modulated signal to regulate power delivered to said output filter, a feedback loop controller comprises:

at least one delay control circuit adapted to delay delivery of said pulse
15 width modulated signal to at least one of said first and second switches to preclude simultaneous conduction of said first and second switches, said delay control circuit detecting a phase difference between state transitions of said first and second switches and providing a delay corresponding to a magnitude of said phase difference.

9. The controller of Claim 8, wherein said delay control circuit further
20 comprises a phase detector providing an up or down signal proportional to said phase difference.

10. The controller of Claim 9, wherein said delay control circuit further comprises a charge pump coupled to said phase detector and converting said up or down signal to a control voltage.

11. The controller of Claim 10, wherein said delay control circuit further comprises an analog delay device providing a time delay corresponding to said control voltage.

12. The controller of Claim 10, wherein said delay control circuit further
5 comprises a capacitor coupled to said charge pump, said capacitor integrating said control voltage.

13. The controller of Claim 8, wherein said at least one delay control circuit further comprises a first delay control circuit associated with said first switch and a second delay control circuit associated with said second switch.

10 14. A method of controlling a switched mode power supply comprising a first switch coupled to an input power source, a second switch coupled to ground, and an output filter coupled to a phase node defined between said first and second switches, said first and second switches being responsive to a pulse width modulated signal to regulate power delivered to said output filter, said method comprising:

15 detecting a phase difference between state transitions of said first and second switches;

generating a variable duration delay in accordance with a magnitude of said phase difference; and

20 delaying delivery of said pulse width modulated signal to at least one of said first and second switches by the variable duration delay;

wherein simultaneous conduction of said first and second switches is precluded and dead time between state transitions of said first and second switches is minimized.

15. The method of Claim 14, wherein said generating step further comprises
25 generating an up or down signal corresponding to said phase difference.

16. The method of Claim 15, wherein said generating step further comprises increasing or decreasing a control voltage in accordance with said up or down signal, respectively.

17. The method of Claim 16, wherein said generating step further comprises
5 converting said control voltage to an analog delay value.

18. The method of Claim 17, wherein said generating step further comprises integrating said control voltage.